

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

Reserve
1.9
0772 Ht

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
Bureau of Plant Industry, Soils,
and Agricultural Engineering

H. T. & S. Office Report No. 301

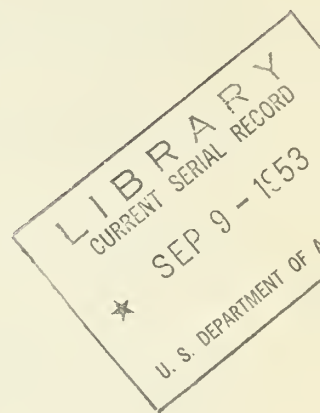
✓ The Shelf Life of Florida Valencia Oranges in Retail Store
Display Cases X

✓ By

William E. Lewis, Senior Horticulturist

Division of Handling, Transportation and
Storage of Horticultural Crops

Report of a study made under the
Research & Marketing Act of 1946
Rm:c 52



Beltsville, Maryland
August 1953

The Shelf Life of Florida Valencia Oranges in Retail Store Display Cases

Introduction

The purpose of this study was to determine the effects of various retail store display and handling methods on the quality and condition of Florida Valencia oranges. Tests were made in May, 1953 in a laboratory at Beltsville, Md., equipped to simulate several different retail store display practices.

Operation of the Display Room

The oranges were size 216 and were obtained in original containers from the Washington, D.C. wholesale produce market. They were displayed for 6 days as follows:

1. Continuously in a non-refrigerated case.
2. In a non-refrigerated case during the daytime and stored in 32° and 40° F. "walk-in coolers" at night.
3. In a mechanically refrigerated case (forced-air-circulation type).

A 6-foot wood display case with galvanized metal bottom and sides was used for non-refrigerated display. It was provided with a slatted rack sloping towards the front. The distance from the front to the back of the case was 30 inches.

A 10-foot commercial, mechanically refrigerated case (forced-air-circulation type) was used for the refrigerated display.

The display cases were in a room on the ground floor of a well insulated brick building.

Storage rooms held at 32° F. and 40° were used for night storage of oranges displayed during the daytime in the non-refrigerated case. The temperatures in these rooms were thermostatically controlled, and small fans were used to circulate the air. The relative humidity was kept at approximately 85 percent.

In each of the display cases, one lot was sprinkled several times daily and a duplicate lot was not sprinkled. However, the non-sprinkled oranges that had been held overnight in the "coolers" became wet from condensed moisture when they were returned to the non-refrigerated rack each day.

The display period began between 8:00 A.M. and 9:00 A.M. and ended between 6:00 P.M. and 7:00 P.M.

The average daytime display room air temperatures during three testing periods were 76°, 81°, and 77° F. and the average relative humidities were 70, 70, and 73 percent respectively.

Fruit temperatures were obtained with fruit thermometers and thermocouples which were inserted into oranges located at the same relative positions on each of the display racks. The relative humidities were obtained with a hygrothermograph.

Decayed oranges and those showing noticeable aging (shriveling and collapse of the rind tissues around the stem button) were discarded and the remainder sorted into representative samples before they were arranged on the various racks at the start of the tests. The oranges were displayed 3 layers deep, extending from the front to the back of each rack. There were approximately 60 oranges in each lot.

Results

The average 24-hour temperatures of oranges displayed in the non-refrigerated case during the daytime and held overnight in the 32° and 40° F. storage rooms were, respectively, 21 and 17 degrees lower than for oranges displayed continuously with no refrigeration at night. The temperature of oranges stored overnight in the 32° room after daytime display on the non-refrigerated rack averaged 50°, and for those held at night in the 40° room it averaged 54°. The temperature of oranges displayed continuously in the mechanically refrigerated case averaged 40°, and the average room temperature was 71°.

Changes in fruit quality and condition studied in these tests included development of decay, rind breakdown, aging, softness, and moisture loss. The effect of sprinkling with tap water several times daily was also noted. The results are presented in table 1.

Decay was important only in oranges that were not refrigerated at all. The non-refrigerated oranges, both sprinkled and non-sprinkled, showed considerable variations in the development of decay during different test periods. During the May 6th test period, 42 percent of the non-sprinkled and 32 percent of the sprinkled oranges were decayed at the end of 6 days, whereas during the two other test periods not more than 6 percent of the oranges had developed decay in either sprinkled or non-sprinkled fruit. The average amount of decay found in the non-refrigerated oranges that were not sprinkled was 17 percent and the sprinkled, 13 percent. Only a small percentage of decay was found under all other handling practices at the end of the 6-day display period. Decay was mostly stem end rot, with some blue mold rot.

There were no consistent differences in aging between the refrigerated and the non-refrigerated oranges. During the May 12th test period the oranges under all handling practices showed very little aging at the end of 6 days. During the other two test periods aging increased rapidly under all handling practices after the third day.

Rind breakdown (other than aging at the stem end) and softening of the fruit were of little importance.

The non-sprinkled oranges that were not refrigerated showed approximately 3 percent greater moisture loss than the sprinkled at the end of 6 days. There were no significant differences between the sprinkled and non-sprinkled oranges under the other handling practices.

Suggestions for Prolonging the Shelf Life
of Florida Valencia Oranges

Oranges received in good condition by retail store operators may be held for two or three days at room temperatures without excessive deterioration. When held for longer periods or when the fruit shows signs of aging it should be moved quickly into consumption or held at night in cold rooms if no equipment is available for daytime refrigeration. Low temperatures will retard the development of decay.

Sprinkling with tap water or moisture from condensation slightly reduced moisture loss and had no harmful effect upon the condition of the fruit.

Table 1. Effects of Various Retail Store Handling Practices upon the Condition of Florida Valencia Oranges

Treatment and Test Dates	Fruit Displayed 3 Days				Fruit Displayed 6 Days			
	Moist-ure gain or loss	Decayed	Aged	Soft break-down	Moist-ure gain or loss	Decayed	Aged	Soft break-down
	%	%	%	%	%	%	%	%
Non-refrig. continuously-not sprinkled								
May 6, 1953	-1.9	13	8	4	0	42	23.	4
" 12, "	-1.6	0	0	0	0	4	4.	0
" 19, "	-2.7	0	0	0	0	6	50.	0
Averages	-2.1	4.3	2.7	1.3	0	17.0	26.	1.3
Non-refrig. continuously-sprinkled								
May 6, 1953	-0.3	8	9	4	0	32	36.	6
" 12, "	-0.1	4	0	0	0	6	2.	0
" 19, "	-1.2	0	0	0	0	2	52.	0
Averages	-0.5	4.0	3.0	1.3	0	13.0	30.	2.0
Non-refrig. days-40° F. nights-not sprinkled								
May 6, 1953	-3.3	4	7	4	0	4	42.	6
" 12, "	+0.2	0	0	0	0	0	7.	0
" 19, "	-0.5	0	0	0	0	0	32.	0
Averages	-1.2	1.3	2.3	1.3	0	1.3	27.	2.0
Non-refrig. days-40° nights-sprinkled								
May 6, 1953	-0.3	2	10	2	0	4	34.	4
" 12, "	+0.1	2	0	0	0	2	6.	0
" 19, "	-0.9	0	0	0	0	0	36.	0
Averages	-0.4	1.3	3.3	0.7	0	2.0	25.	1.3
Non-refrig. days-32° nights-not sprinkled								
May 6, 1953	-0.7	0	8	2	0	0	36.	4
" 12, "	+0.4	0	0	0	0	2	2.	0
" 19, "	-1.1	0	0	0	0	0	20.	0
Averages	-0.5	0	2.7	0.7	0	0.7	19.	1.3

Table 1. (Continued)

Treatment and Test Dates	Fruit Displayed 3 Days				Fruit Displayed 6 Days			
	Moist-ure gain or loss	Decayed	Aged Rind	Soft break-down	Moist-ure gain or loss	Decayed	Aged Rind	Soft break-down
	%	%	%	%	%	%	%	%
Non-refrig. days-32° nights-sprinkled								
May 6, 1953	-0.5	0	6	4	0	-1.2	2	36.
" 12, "	+0.6	0	0	0	0	-0.2	0	0.
" 19, "	-0.8	0	0	0	0	-1.4	0	18.
Averages	-0.2	0	2.0	1.3	0	-0.9	0.7	18.
								2.0
								2.3
Mech. refriger. case continuously-not sprinkled								
May 6, 1953	-1.7	1	4	4	0	-1.7	1	61.
" 12, "	0.0	0	0	0	0	-0.7	0	6.
" 19, "	-1.2	0	0	0	0	-1.9	0	45.
Averages	-1.0	0.3	1.3	1.3	0	-1.4	0.3	37.
								2.0
								0.7
Mech. refriger. case continuously-sprinkled								
May 6, 1953	-1.2	0	4	1	0	-1.2	0	47.
" 12, "	+0.4	0	0	0	0	0.0	0	2.
" 19, "	-0.8	0	0	0	0	-1.4	0	49.
Averages	-0.5	0	1.3	0.3	0	-0.9	0	33.
								1.0
								0.7

